Intro & Assumptions

This Excel workbook contains "Life-Cycle Cost Analysis" (LCCA) and carbon analysis, for new buildings, additions,
& major renovations at the University of Michigan. The data for the Flint and Dearborn campuses is currently a work in progress.
This workbook represents a cross functional effort from multiple units across the University.

OVERVIEW		This workbook is a intended to be a design tool for evaluating project alternatives that fulfill the same/similar performance requirements. Project specific data should be entered within the orange cells on the "Input" tab. The financial and carbon (i.e., operational & embodied) impacts are determined and summarized on the "LCCA Proposed Alternatives" tab. Please note that the analysis is not intended to be predictive of actual costs or carbon impacts ("your mileage may vary").
Key Assumptions	Alternate Premium Costs	The estimated premium cost of the design alternative above/beyond the Project Baseline. The cost of the "Baselines" are not requested because this analysis is intended to compare different design alternatives, so we felt that using the alternatives cost premium would more accurately represent the decision which was intended to be considered.
	Annual Fuel Use	As determined by energy modeling. Information is entered on the "Input" tab in units indicated for the particular fuel.
	ASHRAE Baseline	The baseline which is prescribed by applicable version of ASHRAE. Information is entered on the "Input" tab in applicable cells.
	Chilled Water (Made at Building)	This workbook assumes that energy required to produce chilled water will be included within applicable annual fuel use on the "Input" tab. Note - If chilled water at building is produced using only electricity, then see "Chilled Water from Central Plant" and select "On-Site (All Elect.) Chiller Plant" from drop down list.
	Chilled Water from Central Plant	This workbook has the ability to calculate the energy required to produce chilled water from one of the central chilled water plants on the Ann Arbor Campus. On the "Input" use the drop down to select the chilled water plant which the project is connected to and provide the annual ton hours of chilled water required. The workbook will automatically update the applicable (i.e., electric and/or steam) annual fuel use.
	Embodied Carbon	In order to coordinate with LEED, the embodied carbon for this analysis includes the following systems: exterior envelope, structure footings/foundations, and structural wall/floors/cladding assemblies. To coordinate with LEED please report "cradle to gate" (A1 - A3) values.
	Emissions	Emissions are calculated based upon data provided by UM Office of Campus Sustainability.
	Energy Costs	Energy Costs are calculated based upon data provided by UM Utilities.
	EUI	EUI is determined by dividing a building's total annual energy consumption, in KBtU, by its square footage. This is done to normalize the energy consumption of buildings of different types and sizes to compare their relative energy efficiency level. Note this workbook reports the EUI provided by the design team.

Data	Project specific data should be entered within the orange cells on the "Input" tab by the design team.
Life-Cycle Cost Analysis	The Life-Cycle Costs Analysis (LCCA) compares the various design alternatives to the ASHRAE baseline. The LCCA value is the design alternative's project cost premium less any lifetime energy savings to support the comparison of alternatives. To reinforce the decision, the LCCA for the ASHRAE Baseline is "N/A," and the Project Baseline is "base case".
"Lifetime"	For purposes of this analysis "lifetime" a 30-year time period is assumed. It is calculated/determined as Project's Energy Year, as input on the AE Input tab, plus twenty-nine (29) years.
Other	Please contact the project's AEC Design Manager with any questions or concerns.
Power Purchase Agreement (PPA)	The University currently has a power purchase agreement (PPA) with DTE for 200,000 MWH of renewables. The "PPA-200,000MWH Renewable" should be used for all projects on the Ann Arbor campus at this time. The "No Power Purchase Agreement" should be used for all projects on the Dearborn and Flint campuses. The "PPA-All Purchase Renewable" is included for what-if comparisons. The applicable PPA is selected via a pulldown menu on the "Output" tab.
Project Baseline	The alternative which the team defines as it's baseline. This baseline should include all of the project specific programmatic and energy goals. Information is entered on the "Input" tab within applicable cells.
Selected Design	The alternative which the team ultimately decides to proceed with. Information for the selected option is entered on the "Input" tab within applicable cells. This information should be updated at the completion of each subsequent phase of the project.

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Project Data

AEC Project Name

AEC Project Number

A/E Consultant

Project Phase

Today's Energy Year

Today's Date

The year the facility will be completed & occupied (i.e., first year of operation)

GSF Area Breakdown

New/Addition		*GSF*
Renovation		*GSF Not Used*
Total	-	*GSF (self-calculates)*

Use Classification (from list below)	**Use % of GSF**	
Educational (No Labs)		*Low-tech instructional space with conventional A/V systems*
Educational (Dry Labs)		*Active learning with high-tech/energy-intensive A/V equipment, and/or non-wet lab equipment*
Educational (High-Load Labs)		*Instructional and/or research lab spaces, energy-intensive equipment*
Library		*Traditional library space with book storage, fixed/flexible seating (not including food service, instructional or computing spaces)*
Clinical Outpatient Business		*Typical outpatient clinical space with exam rooms & offices*
Clinical Outpatient Ambulatory		*Clinical space with ambulatory arrival*
Clinical Inpatient		*Inpatient clinical space*
Residential (Dormitory)		*Student housing (includes support spaces except dining & commercial kitchens)*
Administrative		*Offices & meeting spaces with conventional A/V systems*
Athletic Low Intensity		*Varsity practice and/or Rec. Sports athletic competition (non-spectator)*
Athletic Medium Intensity		*Varsity team HQ and Rec. Sports facilities*
Athletic High Intensity		*Varsity competition, natatorium with deck and assoc. locker, sports med., therapy pools & training/conditioning & rehab*
Other		*Other uses which do not explicitly fit into other PCCN use classifications (i.e., vivarium, commercial kitchens, event spaces, collection spaces, etc.)*
	0%	*Total (self-calculates) Should be 100%*

Design Alternatives:

			ASHRAE Baseline	Project Baseline	Alt #1	Alt #2	Alt #3	Alt #4	Selected Design
Alternative (Brief) Title		*Example*	ASHRAE Baseline	-	-	-	-	-	
Alternate Description		*Type of HVAC* *Type of structure* *Type of on-site renewables*							
Site **EUI** Per Energy Model	KBtU/SF	*27*					-		
DTE Electricity	KWH	-	-	-	-	-	-	-	-
CPP Electricity	KWH	-	-	-	-	-	-	-	-
DTE Electricity (Dearborn)	KWH		-	-	-	-	-	-	-
Consumers Energy Electricity (Flint)	KWH		-	-	-	-	-	-	-
DTE Natural Gas	CCF	-	-	-	-	-	-	-	-
DTE Natural Gas (Dearborn)	CCF		-	-	-	-	-	-	-
Consumers Natural Gas (Flint)	CCF		-	-	-	-	-	-	-
CPP Steam	MLB	-	-	-	-	-	-	-	-
Satellite Steam	MLB	-	-	-	-	-	-	-	-
Dearborn Steam	MLB		-	-	-	-	-	-	-
Flint Steam	MLB		-	-	-	-	-	-	-
Select a Chiller Plant	Ton-Hours	-	-	-	-	-	-	-	-
Water/Sewer	CCU	-	-	-	-	-	-	-	-
Alternate Cost Premium (Project Cost)				N/A	N/A				
Embodied Carbon GWP	MT C02e								